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Commissioner for Patents

P.O.Box 1450

Alexandria, VA 22313-1450

VERIFICATION OF TRANSLATION

Sir:

I, Mika Tatsumi, C/O Semiconductor Energy Laboratory Co., Ltd. 398, Hase, Atsugi-shi, Kanagawa-ken 243-0036 Japan, a translator, herewith declare:

that I am well acquainted with both the Japanese and English Languages;

that I am the translator of the attached translation of the Japanese Patent Application No. 2000-337193 filed on November 6, 2000 and

that to the best of my knowledge and belief the followings is a true and correct translation of the Japanese Patent Application No. 2000-337193 filed on November 6, 2000.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: this 30st day of November 2004

Mika Tatsumi

Name: Mika Tatsumi

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[Inventor]

[Address] 398, Hase, Atsugi-shi, Kanagawa-ken
c/o Semiconductor Energy Laboratory Co., Ltd.

[Name] Shunpei YAMAZAKI

[Patent Applicant]

[Identification Number] 000153878

[Name] Semiconductor Energy Laboratory Co., Ltd.

[Representative] Shunpei YAMAZAKI

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[Proof] required

[Name of Document] Specification

[Title of the Invention] DISPLAY DEVICE

[Scope of Claim]

[Claim 1] A display device mounted on a vehicle characterized in that the vehicle has a side mirror, and

the display device is mounted in the side mirror.

[Claim 2] A display device mounted on a vehicle characterized in that the vehicle has a back mirror, and

the display device is mounted in the back mirror.

[Claim 3] A display device mounted on a vehicle characterized in that the vehicle has a plurality of cameras, and

an image taken by the plurality of cameras is displayed on the display device.

[Claim 4] A display device mounted on a vehicle characterized in that the vehicle has a side mirror and a plurality of cameras,

the display device is mounted in the side mirror, and

an image taken by the plurality of cameras is displayed on the display device.

[Claim 5] A display device mounted on a vehicle characterized in that the vehicle has a back mirror and a plurality of cameras,

the display device is mounted in the back mirror, and

an image taken by the plurality of cameras is displayed on the display device.

[Claim 6] A display device mounted on a vehicle characterized in that the vehicle has a plurality of cameras, a CPU and a control circuit,

information read from the plurality of cameras is output to a video signal processing section in the CPU,

the video signal processing section outputs a video signal to the control circuit,

the control circuit outputs an image signal and a clock signal to the

display device, and

an image taken by the plurality of cameras is displayed on the display device.

[Claim 7] A display device mounted on a vehicle characterized in that

the vehicle has a side mirror, a plurality of cameras, a CPU and a control circuit,

the display device is mounted in the side mirror,

information read from the plurality of cameras is output to a video signal processing section in the CPU,

the video signal processing section outputs a video signal to the control circuit,

the control circuit outputs an image signal and a clock signal to the display device, and

an image taken by the plurality of cameras is displayed on the display device.

[Claim 8] A display device mounted on a vehicle characterized in that

the vehicle has a back mirror, a plurality of cameras, a CPU and a control circuit,

the display device is mounted in the back mirror,

information read from the plurality of cameras is output to a video signal processing section in the CPU,

the video signal processing section outputs a video signal to the control circuit,

the control circuit outputs an image signal and a clock signal to the display device, and

an image taken by the plurality of cameras is displayed on the display device.

[Claim 9] The display device according to any one of Claims 3 to 8 characterized in that the camera is a CCD camera.

[Claim 10] A display device mounted on a vehicle characterized in that

the vehicle has a plurality of sensors,

the plurality of sensors have means for measuring a distance between vehicles,

information read from the plurality of sensors is displayed on the display device.

[Claim 11] A display device mounted on a vehicle characterized in that

the vehicle has a side mirror and a plurality of sensors,

the display device is mounted in the side mirror,

the plurality of sensors have means for measuring a distance between vehicles,

information read from the plurality of sensors is displayed on the display device.

[Claim 12] A display device mounted on a vehicle characterized in that

the vehicle has a back mirror and a plurality of sensors,

the display device is mounted in the back mirror,

the plurality of sensors have means for measuring a distance between vehicles,

information read from the plurality of sensors is displayed on the display device.

[Claim 13] A display device mounted on a vehicle characterized in that

the vehicle has a plurality of sensors, a CPU and a control circuit,

the plurality of sensors have means for measuring a distance between vehicles,

information read from the plurality of sensors is output to a video signal processing section in the CPU,

the video signal processing section outputs a video signal to the control circuit,

the control circuit outputs an image signal and a clock signal to the display device, and

information read from the plurality of sensors is displayed on the display device.

[Claim 14] A display device mounted on a vehicle characterized in that

the vehicle has a side mirror, a plurality of sensors, a CPU and a control circuit,

the display device is mounted in the side mirror,

the plurality of sensors have means for measuring a distance between vehicles,

information read from the plurality of sensors is output to a video signal processing section in the CPU,

the video signal processing section outputs a video signal to the control circuit,

the control circuit outputs an image signal and a clock signal to the display device, and

information read from the plurality of sensors is displayed on the display device.

[Claim 15] A display device mounted on a vehicle characterized in that

the vehicle has a back mirror, a plurality of sensors, a CPU and a control circuit,

the display device is mounted in the back mirror,

the plurality of sensors have means for measuring a distance between vehicles,

information read from the plurality of sensors is output to a video signal processing section in the CPU,

the video signal processing section outputs a video signal to the control circuit,

the control circuit outputs an image signal and a clock signal to the display device, and

information read from the plurality of sensors is displayed on the display device.

[Claim 16] A display device mounted on a vehicle characterized in that

the vehicle has a plurality of sensors,

the plurality of sensors have means for detecting an impact of the vehicle,

and

information read from the plurality of sensors is displayed on the display device.

[Claim 17] A display device mounted on a vehicle characterized in that

the vehicle has a side mirror and a plurality of sensors,

the display device is mounted in the side mirror,

the plurality of sensors have means for detecting an impact of the vehicle, and

information read from the plurality of sensors is displayed on the display device.

[Claim 18] A display device mounted on a vehicle characterized in that

the vehicle has a back mirror and a plurality of sensors,

the display device is mounted in the back mirror,

the plurality of sensors have means for detecting an impact of the vehicle, and

information read from the plurality of sensors is displayed on the display device.

[Claim 19] A display device mounted on a vehicle characterized in that

the vehicle has a plurality of sensors, a CPU and a control circuit,

the plurality of sensors have means for detecting an impact of the vehicle,

information read from the plurality of sensors is output to a video signal processing section in the CPU,

the video signal processing section outputs a video signal to the control circuit,

the control circuit outputs an image signal and a clock signal to the display device, and

information read from the plurality of sensors is displayed on the display device.

[Claim 20] A display device mounted on a vehicle characterized in that

the vehicle has a side mirror, a plurality of sensors, a CPU and a control circuit,

the display device is mounted in the side mirror,

the plurality of sensors have means for detecting an impact of the vehicle,

information read from the plurality of sensors is output to a video signal processing section in the CPU,

the video signal processing section outputs a video signal to the control circuit,

the control circuit outputs an image signal and a clock signal to the display device, and

information read from the plurality of sensors is displayed on the display device.

[Claim 21] A display device mounted on a vehicle characterized in that

the vehicle has a back mirror, a plurality of sensors, a CPU and a control circuit,

the display device is mounted in the back mirror,

the plurality of sensors have means for detecting an impact of the vehicle,

information read from the plurality of sensors is output to a video signal processing section in the CPU,

the video signal processing section outputs a video signal to the control circuit,

the control circuit outputs an image signal and a clock signal to the display device, and

information read from the plurality of sensors is displayed on the display device.

[Claim 22] A display device mounted on a vehicle characterized in that

the vehicle has an audio device.

[Claim 23] A display device mounted on a vehicle characterized in that

the vehicle has an audio device, and

the audio device has a microphone and a speaker.

[Claim 24] A display device mounted on a vehicle characterized in that

the vehicle has an audio device,

the audio device has a microphone and a speaker, and

a sound around the vehicle can be recognized in an interior of the vehicle by the audio device.

[Claim 25] A display device mounted on a vehicle characterized in that

the vehicle has an alarm device, and

the alarm device has an audio processing circuit, a microphone, a speaker, a control circuit and the display device.

[Claim 26] A display device mounted on a vehicle characterized in that

the vehicle has an alarm device, an impact sensor and a CPU,

the alarm device has an audio processing circuit, a microphone, a speaker, a control circuit and the display device,

the impact sensor has means for detecting an impact of the vehicle,

a signal is output to the CPU when the impact sensor detects the impact of the vehicle,

the CPU outputs a danger signal to the audio processing circuit and the control circuit,

the audio processing circuit outputs a signal for warning a danger to the microphone, and

the control circuit outputs a signal for an indication of the danger to the display device.

[Claim 27] A display device mounted on a vehicle characterized in that

the vehicle has a side mirror, an alarm device, an impact sensor and a CPU,

the display device is mounted in the side mirror,

the alarm device has an audio processing circuit, a microphone, a speaker, a control circuit and the display device,

the impact sensor has means for detecting an impact of the vehicle,

a signal is output to the CPU when the impact sensor detects the impact of the vehicle,

the CPU outputs a danger signal to the audio processing circuit and the control circuit,

the audio processing circuit outputs a signal for warning a danger to the microphone, and

the control circuit outputs a signal for an indication of the danger to the display device.

[Claim 28] A display device mounted on a vehicle characterized in that

the vehicle has a back mirror, an alarm device, an impact sensor and a CPU,

the display device is mounted in the back mirror,

the alarm device has an audio processing circuit, a microphone, a speaker, a control circuit and the display device,

the impact sensor has means for detecting an impact of the vehicle,

a signal is output to the CPU when the impact sensor detects the impact of the vehicle,

the CPU outputs a danger signal to the audio processing circuit and the control circuit,

the audio processing circuit outputs a signal for warning a danger to the microphone, and

the control circuit outputs a signal for an indication of the danger to the display device.

[Claim 29] The display device according to any one of Claims 1 to 28 characterized in that mirrors mounted in the side mirror and the back mirror are half mirrors.

[Claim 30] The display device according to any one of Claims 1 to 29 characterized in that the display device is one of a transmission-type liquid crystal display device, a reflection-type liquid crystal display device and an EL display device.

[Claim 31] A vehicle characterized by being provided with the display device according to any one of Claims 1 to 30.

[Detailed description of the Invention]

[0001]

[Technical Field to which the Invention pertains]

The present invention relates to the structure and functions of vehicles for conveyance of people and goods, for towing thereof and for special purposes. Particularly, the present invention relates to the structure and functions of side and back mirrors mounted on a vehicle.

[0002]

[Prior Art]

A vehicle used in this specification refers to an electric train, a motor vehicle or the like. Popularization of vehicles typified by motor vehicles is progressing because of their convenience.

[0003]

A vehicle is provided with a side mirror (door mirror) and a back mirror (room mirror), which are used at the time of lane change of a motor vehicle or the like.

[0004]

[Problem to be solved by the Invention]

When a driver driving a vehicle on a road makes a lane change, it is difficult for the driver to perform visual confirmation. When a driver confirms visibly in backing the vehicle into a carport, a place at the rear of the vehicle is in the driver's blind spot. In such situations, the driver drives the vehicle while relying on scenes reflected by the side and back mirrors. However, the field of view (visible area) through each of the side and back mirrors is not sufficiently wide.

[0005]

Therefore, the present invention aims to widen the fields of view through side and back mirrors.

[0006]

It is important that a driver driving a vehicle should recognize the distance to vehicles on back, forth, left and right sides to avoid a traffic accident. However, drivers usually speed excessively when driving in the night. Further, drivers tend to speed excessively in an ordinary road after moving from a highway to the ordinary road because the driver has driven at high speed on the highway. Traffic accidents occur frequently in such situations, because drivers do not correctly recognize the vehicle speed and the distance (vehicular gap) to vehicles on back, forth, left and right sides.

[0007]

Therefore, it is desirable that a driver who drives a vehicle and a fellow passenger be able to obtain necessary information such as the distance between vehicles at will.

[0008]

[Means for solving the Problem]

According to the present invention, so as to enable a driver driving a vehicle to confirm safety even when it is difficult to visually confirm, a liquid crystal display device or an EL display device is provided in a side mirror (door mirror) and a back mirror (room mirror) of the vehicle. In this specification, the liquid crystal display device and the EL display device will be collectively called a display device.

[0009]

A camera is provided for the vehicle and an image obtained by the camera is displayed on the display device, thereby widening the field of view obtained through the side mirror or the back mirror. Information read from a sensor (distance measuring sensor) having the function of measuring the distance between vehicles, and a sensor (impact sensor) having the function of sensing an externally applied impact force equal to or larger than a predetermined value is displayed on the display device.

[0010]

An alarm device is also provided for the vehicle used in the present invention. The alarm device includes an audio device, a display device and a control circuit. When the impact sensor detects a danger signal, the signal is supplied to a CPU provided

inside the vehicle. The CPU supplied with the danger signal outputs a signal for indication of a danger to the display device and a signal for warning of the danger to the audio device. The display device gives an indication of the danger and the audio device gives a warning of the danger.

[0011]

[Embodiment Mode of the Invention]

The term vehicle used in this specification refers to vehicles such as an electric train and a motor vehicle for conveyance of people and goods. In vehicles, there is a vehicle having an energy source and a prime mover. The energy source is electricity or gasoline. The prime mover supplies necessary power for running of the vehicle, which is called an engine. The vehicle also has a body, a power transmission device, a braking system, a steering mechanism, a suspension device, auxiliary equipment, and accessories in addition to the energy source and the prime mover in many cases.

[0012]

Fig. 1 is a top view of the vehicle, which is a motor vehicle. In this specification, a forward portion of the vehicle will be referred to as a front portion, and a backward portion of the vehicle will be referred to as a rear portion with respect to a forward traveling direction of the vehicle. The motor vehicle illustrated in Fig. 1 uses four wheels 106, two of which are each provided in the front portion and in the rear portion and which are used in motor vehicle traveling. The motor vehicle also has four lights 107, two of which are respectively provided on the front and rear portions.

[0013]

CCD (Charge-coupled device) cameras are used in Fig. 1 as an example of the camera. A CCD camera provided on the left side of the front portion of the vehicle will be referred to as a CLF (CCD left front) 100; a CCD camera on the right side of the front portion of the vehicle, as a CRF (CCD right front) 101. Further, in the rear portion of the vehicle, a CCD camera will be referred to on the left side as a CLR (CCD left rear) 102; and a CCD camera on the right side of the vehicle, as a CRR (CCD right rear) 103, with respect to the forward traveling direction of the vehicle.

[0014]

A camera of a so-called fisheye structure capable of image pickup in all directions through 360° is used as each of the CCD cameras that are CLF 100, CRF 101, CLR 102, and CRR 103 shown in Fig. 1. In Fig. 1, two pairs of these CCD cameras are respectively mounted on the front and rear portions of the vehicle and used to image the surrounding of the vehicle. The number of cameras and the placement of cameras are not limited to those. For example, a camera may be mounted on the roof of the vehicle. While CCD cameras are used as the cameras in Fig. 1, the present invention is not limited to this, and any other type of cameras that are capable of image pickup may be used.

[0015]

The vehicle is provided with two side mirrors. The side mirror on the left side will be referred to as a DL (display left) 104 and the side mirror on the right side will be referred to as a DR (display right) 105. The side mirrors are mounted on the opposite sides of the body of the vehicle. Positions at which they are attached are indicated in Fig. 1 as one example. Each of the DL 104 and the DL 105 has a display device which is any one of a transmission-type liquid crystal display device, a reflection-type liquid crystal display device and an EL display device.

[0016]

Fig. 2 shows a front view of the vehicle shown in Fig. 1. The DL 107 is provided on the left side of the vehicle and the DR 105 is provided on the right side. The lights 107, the wheels 106, the wipers 114, an antenna 116 and the like are also provided.

[0017]

One microphone 111 and one sensor 112 are each provided on each of the right and left sides of the vehicle, although not shown in Fig. 1. The vehicle also has a back mirror (room mirror) mounted in the interior of the vehicle so as to be superposed on a windshield 115. In this specification, the back mirror (room mirror) will be referred to as a BD (back display) 110. The BD 110 is provided for the driver's seat or the like of the vehicle and the place thereof is shown in Fig. 2 as one example. The BD 110 is

provided with a display device which is any one of a transmission-type liquid crystal display device, a reflection-type liquid crystal display device and an EL display device.

[0018]

Fig. 3 shows a rear view of the vehicle shown in Fig. 1. The vehicle has lights 107 and wheels 106. The vehicle also has CLR 102 on the left side and CRR 103 on the right side. One microphone 111 and one sensor 112 are mounted on each of the right and left sides of the vehicle.

[0019]

Fig. 4 shows the BD 110 is the back mirror (room mirror) provided in the interior of the vehicle, and is an enlarged view of the BD 110 shown in Fig. 2. The BD 110 has a frame 200, a display device 201, and a connecting portion 202. The frame 200 is made of a material having sufficiently high strength and easily workable, such as a plastic. A drive circuit, wirings, etc., for the display device are provided in a lower portion of the frame. The connecting portion 202 protects the wiring of the display device connected to the CPU or the like.

[0020]

Fig. 4(A) shows a state where no image is displayed on the display device 201. Fig. 4(B) shows a state where an image taken by the CCD camera provided for the vehicle is displayed on the display device 201. In Fig. 4(B), a date and a time are displayed to be superposed on the image.

[0021]

Fig. 4(C) shows a state of the BD 110 without the frame 200 of the display device 201, and shows a pixel portion 206, a source signal line drive circuit 204, a gate signal line drive circuit 204, an external input terminal to which an FPC (flexible printed circuit) 203 is attached, and a wiring 206 for connecting the external input terminal to input portions of the respective circuits, and the like. The FPC 203 is connected to a CPU through the connecting portion 202.

[0022]

Fig. 5 shows the side mirror provided for the vehicle and is an enlarged view of

the side mirror DR 105 mounted on the right side of the vehicle shown in Fig. 1. The side mirror DR 104 mounted on the left side of the vehicle has a shape formed by horizontally flipping the side mirror DR 105. A display device is provided for the DR 105, which has a frame 210, a display device 211 and a connecting portion 212. The frame 210 is made of a material having sufficiently high strength and easily workable such as a plastic. A drive circuit, wirings, etc., for the display device are provided in a lower portion of the frame.

[0023]

Fig. 5(A) shows a state where no image is displayed on the display device 211. Fig. 5(B) shows a state where an image taken by the CCD camera provided for the vehicle is displayed on the display device 211.

[0024]

Fig. 5(C) shows a state of the DR 105 without the frame 210 of the display device 211, and shows the pixel portion 206, the source signal line drive circuit 204, the gate signal line drive circuit 205, the external input terminal to which the FPC (flexible printed circuit) 203 is attached, and the wiring 206 for connecting the external input terminal to input portions of the respective circuits, and the like. The FPC 203 is connected to the CPU through the connecting portion 302.

[0025]

It is necessary that the display device used in the present invention be formed in such a shape as to be capable of being accommodated in the frame of the side mirror or back mirror. Figs. 4(C) and 5(C) illustrate only examples of the display device. The display device is accommodated in the frame, and wirings of the FPC or the like are connected to the CPU provided for the vehicle through the connecting portion. The shapes of the back mirror shown in Fig. 4 and the side mirror shown in Fig. 5 are only examples, and may have any shape.

[0026]

Fig. 6 is a block diagram showing the structure of the vehicle and the display device used in the present invention.

[0027]

Reference numeral 301 denotes a CPU 301, which has an operating button interface section 302a and a video signal processing section 303. The system illustrated in Fig. 6 is configured so as to be centrally controlled by the CPU 301. Arrows in Fig. 6 indicate signals.

[0028]

Operating buttons are provided in the interior of the vehicle in such a position that a user can easily operate it, for example, in a position closer to the driver's seat. When the operating buttons 302c are operated, a signal from the operating buttons 302c is input to the operating button interface section 302a through a input signal processing circuit 302b. The input signal undergoes processing in the CPU 301 and predetermined signals are thereby output to devices to be output such as an audio processing circuit 305 and a control circuit 309 or to a sensor.

[0029]

An audio device 304 comprises the audio processing circuit 305, a microphone 306, and a speaker 307. The microphone 306 is provided outside the vehicle while the speaker 307 is provided in the interior of the vehicle. The microphone 306 converts sound (sound waves) from surroundings of the vehicle into an electrical signal and outputs it to the audio processing circuit 305. The audio processing circuit 305 outputs a vibrating signal to the speaker 307 to cause mechanical vibration in a diaphragm of the speaker 307, thereby producing sound (sound waves). The user can operate the audio device through the CPU 301 by the operating buttons 302c. That is, the user can hear sounds from surroundings of the vehicle through the audio device arbitrarily.

[0030]

A camera 315 is provided in one or a plurality of places in a vehicle 336 and connected to the CPU 301 through an interface port 314. The user can operate each camera 315 by operating the operating buttons 302c arbitrarily. Information from the camera 315 is input to the CPU 301 through the interface port 314. Data processing is performed in the CPU 301 to display given information on the display device 308 through the control circuit 309. More specifically, information processed in the CPU

301 is output as a video signal (data signal) from the video signal processing section 303 to the control circuit 309. The control circuit 309 supplies the video signal and a clock signal to the display device 308. Concretely, the control circuit 309 has the function of dividing the video signal into data in correspondence with respective pixels of the display device 308, and the function of converting externally-input horizontal and vertical synchronizing signals into a signal for starting the drive circuit, a signal for controlling timing of forming alternating current in an internal power supply circuit, and a clock signal.

[0031]

To the CPU 301 are also connected a VRAM 313, a DRAM311, a flash memory 312, and a memory card 310. The CPU 301 is provided in the vehicle 336 and accommodated in a sturdy heat-resistant box. It is mounted in a place in the vehicle where variation in temperature is comparatively small, such as the lower portion of the driver's seat.

[0032]

The sensors 319 comprise an impact sensor 316 and a distance measuring sensor 317. The user can operate the impact sensor 316 and the distance measuring sensor 317 through the CPU 301 by operating the operating buttons 302c.

[0033]

The impact sensor 316 will be described with reference to Fig. 7. An impact sensor 316 is provided in one or a plurality of places in the vehicle, and senses an externally-applied impact force equal to or larger than a predetermined value and outputs a danger signal when detecting it.

[0034]

In Fig. 7, S1 to S3 represent lapses of time, and arrows represent signals. For example, the impact sensor 316 senses an impact force (S1). The CPU 301 conducts centralized control of the system in the vehicle 336. Data processing is performed when the CPU 301 is supplied with the danger signal (S2). The CPU 301 then outputs a signal to the audio processing circuit 305 in the audio device 304 to warn a driver

driving the vehicle and a fellow passenger of a danger through the speaker 307. The CPU 301 also outputs a signal to the control circuit 309 to display a warning about the danger on the display device 308 (S3). In this specification, the combination of the audio device 304 warning a danger by a sound, the control circuit 309 which outputs signals to the display device 308 and the display device 308 which displays a warning about the danger will be referred to as an alarm device 340.

[0035]

The distance measuring sensor 317 will next be described with reference to Fig. 8. The distance measuring sensors 317 is provided in one or a plurality of places in the body of the vehicle. It is a sensor to measure the distance to vehicles on the front, rear, left and right sides. The user can use the distance measuring sensor 317 by operating the operating buttons 302c arbitrarily.

[0036]

Referring to Fig. 8, a light emitting portion 401 is that of a scanning-type laser. The scanning-type laser scans a laser beam in synchronization with an output signal produced in a light emitting signal output section 403. The laser beam emitted from the distance measuring sensor 317 provided in suitable portions of the vehicle is reflected back by an arbitrary vehicle and received through a light receiving portion 402. The received laser beam is supplied to a distance computation section 405 through a received light signal detection section 404. The distance between the vehicles (vehicular gap) is computed from the time to the moment at which the laser beam is returned by being reflected.

[0037]

Information on the distance between the vehicles computed in the distance computation section 405 is output to the CPU 301 through a distance indication output section 406. In the CPU 301, data processing of the supplied information is performed. A signal is output from the CPU 301 to the control circuit 309 to indicate on the display device 308 the distance between the vehicles computed in the distance computation section. The CPU 301 is connected to the operating buttons 302d to arbitrarily display the information read with the distance measuring sensor on the display device by

operating the operating buttons by the user.

[0038]

Fig. 9 shows an example of displaying information read from the impact sensor and the distance measuring sensor on the display device provided in the back mirror BD 110.

[0039]

In Fig. 9(A), an image from the camera mounted on the vehicle is displayed on the display device. In Fig. 9(B), a date, a time, the distance to a vehicle in front and the distance to a vehicle in back are displayed on the display device in addition of an image from the camera mounted on the vehicle. In Fig. 9(C), an image from the camera mounted on the vehicle and a warning given when the impact sensor detects a detection signal are displayed on the display device.

[EMBODIMENTS]

[Embodiment 1]

An example of a liquid crystal display device which is the display device provided in the side or back mirror will be described in this embodiment.

[0040]

Fig. 10 shows an example of a liquid crystal display device having a pixel portion and a drive circuit for driving it on a substrate (note that it is a state before sealing a liquid crystal material therein).

[0041]

A CMOS circuit, which is a basic unit, is shown in the drive circuit, and one pixel is illustrated in the pixel portion.

[0042]

Referring to Fig. 10, on a substrate are formed the drive circuit 601 constituted by n-channel TFTs 605 and 606 and p-channel TFTs 603 and 604, and the pixel portion 602 constituted by a pixel TFT 607, which is an n-channel TFT, and a storage capacitor 608. In this embodiment, each TFT is formed as a top gate type of TFT.

[0043]

The pixel TFT 607 has a structure (double-gate structure) in which two channel forming regions are provided between a source region and a drain region. This embodiment, however, is not limited to the double-gate structure and a single-gate structure in which one channel forming region is formed or a triple-gate structure in which three channel-forming regions are formed may be used.

[0044]

In this embodiment, a pixel electrode connected to the drain region of the pixel TFT is formed as a reflecting electrode. Preferably, the pixel electrode 610 is formed of a member having high reflectivity, e.g., a film of a material having Al or Ag as a main component or laminated films of such materials. Preferably, the pixel electrode is formed, and then it is processed by an additional well-known sandblasting or etching step to form irregularities in its surface, thereby preventing mirror reflection and scattering reflected light, so that the whiteness level is increased.

[0045]

While the embodiment has been described an example of a reflection type of liquid crystal display device having the pixel electrode formed as a reflecting electrode, a transmission type of liquid crystal display device may be used in which the pixel electrode is formed with a transparent conductive film instead of the reflecting electrode.

[0046]

After obtaining the state shown in Fig. 10, an alignment film is formed over the pixel electrode and undergoes rubbing. In this embodiment, pillar-like spacers for keeping a substrate spacing are formed at predetermined positions by patterning an organic resin film such as an acrylic resin film before the formation of the alignment film. Spherical spacers may be dispersed over the entire substrate surface instead of the pillar-like spacers.

[0047]

Next, an opposed substrate is prepared. A colored layer and a light shielding

layer are formed on the opposed substrate. A leveling film is thereafter formed. Next, a counter electrode formed of a transparent conductive film is formed on the leveling film at least in the pixel portion, and an alignment film is formed on the entire surface of the opposed substrate and rubbed.

[0048]

The stainless substrate on which the pixel portion and the drive circuit are formed and the fixed substrate are attached by an adhesive layer (a sealing material in this embodiment). A filler is mixed in the adhesive layer. The two substrates are attached by being uniformly spaced apart from each other by the filler and the pillar-like spacers. A liquid crystal material is thereafter injected between the two substrates and is completely sealed with a sealant (not shown). The liquid crystal material may employ well-known liquid crystal materials.

[0049]

After the step of sealing the liquid crystal (or encapsulating the liquid crystal) is conducted, the substrate holder is separated. A state of the liquid crystal display device after that will be described with reference to Fig. 11.

[0050]

The top view shown in Fig. 11 shows a state in which a stainless substrate 619 on which a pixel portion, a drive circuit, an external input terminal to which an FPC (flexible printed circuit) is attached, wiring 618 for connecting the external input terminal to input portions of the respective circuits, etc., are formed and an opposed substrate 620 on which a color filter and the like are formed are attached by a sealant 615.

[0051]

A light shielding layer 612a is provided on the opposed substrate side to be superposed on the gate signal line drive circuit 613, and a light shielding layer 612b is provided on the opposed substrate side to be superposed on the source signal line drive circuit 614. The color filter 611 provided on the opposed substrate side over the pixel portion 610 has the light shielding layer and colored layers for colors red (R), green (G),

and blue (B) formed in correspondence with pixels. In actual display, a color image is displayed by using the three colors of the red (R) colored layer, the green (G) colored layer and the blue (B) colored layer. The colored layers having these colors may be arrayed arbitrarily.

[0052]

The color filter 611 for colorization is provided on the opposed substrate, but is not limited in particular. The color filter may be formed on the substrate at the time of device fabrication on the substrate.

[0053]

A light shielding layer is provided between adjacent pixels in the color filter to block light at portions other than the display region. Here, the light shielding layers 612a and 612b are also provided on the regions covering the drive circuit. However, the liquid crystal display device may be formed particularly without light shielding layers because the regions covering the drive circuit are covered with a cover when the liquid crystal display device is incorporated as a display unit in the electronic device. Alternatively, light shielding layers may be formed on the substrate when the necessary elements are fabricated on the substrate.

[0054]

Further, the arrangement may alternatively be such that the above-described light shielding layers are not provided but a plurality of colored layers constituting the color filter are laminated suitably between the opposed substrate and the counter electrode to block light at portions (the gaps between the pixel electrodes) other than the display region and at the drive circuit.

[0055]

The FPC 616 formed of a base film and wiring is attached to the external input terminal by an anisotropic conductive resin. It is mechanically reinforced by a reinforcing plate.

[0056]

A polarizing plate (not shown) is attached only to the opposed substrate.

[0057]

The liquid crystal display device fabricated as described above can be used as a display device mounted in the side or back mirror.

[0058]

Examples of a circuit configuration in the liquid crystal display device in this embodiment is shown in FIG. 12.

[0059]

Fig. 12(A) shows a circuit configuration for analog drive, which has a source line drive circuit 631, a pixel portion 630, and a gate line drive circuit 632 in this embodiment. Note that the drive circuit in this specification collectively refers to the source line drive circuit and the gate line drive circuit.

[0060]

The source line drive circuit 631 has a shift register 631a, a buffer 631b, a sampling circuit (transfer gate) 631c. The gate line drive circuit 632 has a shift register 632a, a level shifter 632b, and a buffer 632c. A level shifter circuit may be provided between the sampling circuit and the shift register if necessary.

[0061]

In this embodiment, the pixel portion 630 includes a plurality of pixels each having a TFT device.

[0062]

All TFT devices provided in the source line drive circuit 631 and the gate line drive circuit 632 can be formed as p-channel TFTs or n-channel TFTs.

[0063]

A gate line drive circuit may also be provided on the side opposite to the gate line drive circuit 632 with the pixel portion 630 therebetween although not shown.

[0064]

If digital drive is performed, latches (A) 634b and (B) 634c may be provided instead of the sampling circuit, as shown in Fig. 12(B). A source line drive circuit 634 has a shift register 634a, a latch (A) 634b, a latch (B) 634c, a D/A converter 634d, and a

buffer 634e. A gate line drive circuit 635 has a shift register 635a, a level shifter 635b, and a buffer 635c. A level shifter circuit may be provided between the latch (B) 634c and the D/A converter 634d.

[0065]

Although only the configurations of the pixel portion and the drive circuit have been described in this embodiment, a memory or a microprocessor may also be formed.

[0066]

This embodiment can be freely combined with Embodiment Mode of the Invention.

[0067]

[Embodiment 2]

In this embodiment, an example in which TFTs used in the pixel portion and the drive circuit of a liquid crystal display device provided as a display device mounted in the side or back mirror are formed as an inverted stagger type of TFT is shown in Fig. 13. Fig. 13(A) is an enlarged top view of one of pixels in the pixel portion. A portion taken along a dotted line A-A' in Fig. 13(A) corresponds to the sectional structure of the pixel portion in Fig. 13(B). Reference numeral 651 in Fig. 13(B) is a substrate having an insulating surface.

[0068]

In the pixel portion, a pixel TFT portion is formed as an n-channel TFT. A gate electrode 652 is formed on the substrate 651. A first insulating film 653a formed of silicon nitride and a second insulating film 653b formed of silicon oxide are formed thereon. On the second insulating film, are formed, as an active layer, n^+ regions 654 to 656, channel forming regions 657 and 658, and n^- regions 659 and 660. The n^- regions 659 and 660 are formed between the n^+ regions and the channel forming regions. The channel forming regions 657 and 658 are protected by insulating layers 661 and 662. Contact holes are formed in a first interlayer insulating film 663 with which the insulating layers 661 and 662 and the active layer are covered. After that, wiring 664

connected to the n^+ region 654 is formed, a pixel electrode 665 made of Al or Ag is connected to the n^+ region 656, and a passivation film 666 is formed thereon. Reference numeral 670 is a pixel electrode adjacent to the pixel electrode 669.

[0069]

In this embodiment, the gate wiring to the pixel TFT in the pixel portion is formed in the double-gate structure. However, a multigate structure such as a triple-gate structure may be used in order to reduce variation in off current. Further, a single gate structure may be used to increase the aperture ratio.

[0070]

The capacitor portion in the pixel portion is formed by capacitor wiring 671 and the n^+ region 656 with the first insulating film and the second insulating film as a dielectric.

[0071]

The pixel portion shown in Fig. 13 is only an example and is not limited to the above-described structure.

[0072]

This embodiment can be freely combined with Embodiment mode of the Invention or Embodiment 1.

[0073]

[Embodiment 3]

An example in which an EL (electroluminescent) display device is provided as a display device mounted in the side or back mirror will be described in this embodiment.

[0074]

Fig. 14 shows an example of a light emitting device in which a pixel portion and a drive circuit for driving it are provided on one substrate (it is in a state before sealing). A CMOS circuit, which is a basic unit, is shown in the drive circuit and one pixel is shown in the pixel portion.

[0075]

Referring to Fig. 14, reference numeral 701 is a substrate on which an insulating

film is formed. The drive circuit 704 constituted by an n-channel TFT and a p-channel TFT, a switching TFT 702, which is a p-channel TFT, and a current control TFT 703, which is an n-channel TFT are formed thereon. In this embodiment, each TFT is formed as a top gate type of TFT.

[0076]

The switching TFT 702 has a structure (double-gate structure) in which two channel forming regions are provided between a source region and a drain region. This embodiment, however, is not limited to the double-gate structure and a single-gate structure in which one channel forming region is formed or a triple-gate structure in which three channel-forming regions are formed may be used.

[0077]

A contact hole is formed in a first interlayer insulating film 707 above a drain region 706 of the current control TFT before a second interlayer insulating film 708 is formed. This is conducted to simplify an etching process when a contact hole is formed in the second interlayer insulating film 708. The contact hole is formed in the second interlayer insulating film 708 so as to reach the drain region 706, and a pixel electrode 709 is formed so as to connect to the drain region 706. The pixel electrode 709 is an electrode which functions as a cathode of an EL element, and which is formed by using a conductive film containing an element which belongs to the group 1 or 2 in the periodic table. In this embodiment, a conductive film formed of a compound of lithium and aluminum is used.

[0078]

An insulating film 713 is formed so as to cover an end portion of the pixel electrode 709. The insulating film 713 will be referred to as bank in this specification. The bank 713 may be formed of an insulating film containing silicon or a resin film. If a resin film is used, carbon particles or metal particles may be added so that the resistivity of the resin film is 1×10^6 to 1×10^{12} Ωm (preferably 1×10^8 to 1×10^{10} Ωm), thereby reducing insulation breakdown at the time of film forming.

[0079]

The EL element 710 is constituted by the pixel electrode (cathode) 709, an EL

layer 711, and an anode 712. As the anode 712, a conductive film having a high work function, typically an oxide conductive film is used. As an oxide conductive film, indium oxide, tin oxide, zinc oxide or a component thereof may be used. The light emitting device in this embodiment is formed as an upward emission type of light emitting device. However, this embodiment is not limited to the upward emission type of light emitting device, and a downward emission type of light emitting device can be formed by suitably changing the structure of the EL element.

[0080]

In this specification, an EL layer is defined as a laminated member having a combination of a light emitting layer and a hole injection layer, a hole transport layer, hole block layer, an electron transport layer, an electron injection layer or an electron block layer.

[0081]

Any EL materials may be used to form the light emitting layer without limitations in particular. For example, a thin film of a light emitting material capable of emitting light by singlet excitation (singlet compound) or a thin film of a light emitting material capable of emitting light by triplet excitation (triplet compound) can be used.

[0082]

Although not shown here, it is effective that after the formation of the anode 712, a passivation film is formed so as to completely cover the EL element 710. The passivation film may be formed of an insulating film including a carbon film, a silicon nitride film or a silicon nitride oxide film, or may be a single layer of such an insulating film or a layer formed by laminating a combination of such insulating films.

[0083]

Up to the step of sealing (encapsulation) for protection of the EL element is performed. The EL display device after that will be described with reference to Figs. 15(A) and 15(B).

[0084]

Fig. 15(A) is a top view when the step of sealing the EL element is completed,

and Fig. 15(B) is a cross-sectional view taken along line A-A' in Fig. 15(A). A region 801 indicated by a dotted line corresponds to a pixel portion, 802 corresponds to a source line drive circuit, and 803 corresponds to a gate line drive circuit. Reference numeral 804 is a cover member, 805 is a first sealing material, and 806 is a second sealing material.

[0085]

Reference numeral 808 is a wiring for transmitting signals to be input to the source line drive circuit 802 and the gate line drive circuit 803, and is supplied with a video signal or a clock signal through the FPC (flexible printed circuit) 808 serving as an external input terminal. A printed wiring base (PWB) may be attached to the FPC.

[0086]

Next, the cross-sectional structure will be described with reference to Fig. 15(B). The pixel portion and a source line drive circuit 809 are formed above a substrate 800. The pixel portion is formed by a plurality of pixels including a current control TFT 710 and a pixel electrode 811 electrically connected to the drain thereof. The source line drive circuit 809 is formed by using a CMOS circuit comprising a combination of n-channel TFTs and p-channel TFTs. A polarizing plate (typically a circularly polarizing plate) may be attached to the substrate 800.

[0087]

Banks 812 are formed on opposite ends of the pixel electrode 811, and an EL layer 813 and an anode 814 of the EL element are formed on the pixel electrode 811. The anode 814 also functions as a common wiring for all the pixels and is electrically connected to the FPC 816 by connection wiring 815. All the elements included in the pixel portion and the source-side drive circuit 809 are covered with a passivation film (not shown).

[0088]

The cover member 804 is attached by the first sealing material 805. Spacers may be provided for spacing between the cover member 804 and the EL device. A space 817 is formed inside the first sealing material 805. It is preferred that the first

sealing material 805 be impermeable to water or oxygen. Further, it is effective to provide in the space 817 a material having a hygroscopic effect or a material having an anti-oxidizing effect.

[0089]

Preferably, a carbon film (specifically, a diamond-like carbon film) having a thickness of about 2 to 30 nm may be formed as a protective film on each of the outer and inner surfaces of the cover member 804. Such a carbon film (not shown here) has the functions of preventing oxygen and water from entering and mechanically protecting the surface of the cover member 804.

[0090]

After bonding of the cover member 804, the second sealing material 806 is provided so as to cover the exposed surface of the first sealing material 805. The same material as the first sealing material 805 can be used for the second sealing material 806.

[0091]

The EL device is encapsulated in the above-described structure to be completely shielded from the outside, thereby preventing substances such water and oxygen capable of degrading the EL layer by oxidation from entering from the outside. Thus, an EL display device having high reliability can be obtained.

[0092]

The EL display device fabricated as described above can be used as a display device mounted in the side or back mirror of the vehicle in the present invention.

[0093]

This embodiment can be freely combined with Embodiment Mode of the Invention, Embodiments 1 or 2.

[0094]

[Embodiment 4]

Next, an example of a structure of the display device of the present invention is described with reference to Figs. 16 and 17. Figs. 16 and 17 show examples of the

back mirror BD 110.

[0095]

Fig. 16 shows an enlarged diagram of the back mirror BD 110 mounted on the vehicle shown in Fig. 2. Fig. 16(A) shows a mirror 220, and Fig. 16(B) shows the display device 201. Fig. 16(C) shows the frame 200. The frame 200 is made of a plastic easily workable or the like and has a cavity.

[0096]

Fig. 16(D) is a cross-sectional view of the back mirror BD 110 seen from the side. The mirror 220 and the display device 201 are placed in the frame 200 to be superposed with each other in such a way that the mirror 220 is a surface. The FPC 203 of the display device 201 is connected via the connecting portion 202 to the CPU provided in the vehicle.

[0097]

The mirror 220 is a mirror called a one-way mirror or half mirror, that is a mirror having a glass plate over which a thin film of a metal is coated and a glass is superposed on the metal film. That is, it is a glass that is a mirror through which the light side can be seen from the dark side, while dark side cannot be seen from the light side. That is, when the display device 201 is not activated, the BD 110 functions as a mirror. When the display device 201 is activated, a user can recognize a display on the display device 201 through the mirror 220.

[0098]

The size of the BD 110 shown in Fig. 17(A) is about twice that of the BD 110 shown in Fig. 16(C). While the mirror 220 and the display device 201 are superposed in the display device in FIG. 16, in the display device 201 shown in Fig. 17(A), the display device 201 is placed parallel to the mirror 220 horizontally.

[0099]

The size of the BD 110 is not specially limited and can be freely selected in designing by a designer.

[0100]

The size of the frame 200 of the BD 110 shown in Fig. 17(B) is approximately the same as that of the BD 110 shown in Fig. 16(B). However, the display device 201 and the mirror 220 each approximately with half size are placed in parallel vertically. The mirrors shown in Fig. 17 may be of any type without limiting to the half mirror shown in Fig. 16 as long as they function as a mirror.

[0101]

This embodiment can be freely combined with Embodiment Mode of the Invention, or Embodiments 1 to 3.

[0102]

[Embodiment 5]

A structure of the display device of the invention is described with reference to FIG. 19 next.

[0103]

In embodiment mode of the invention describes an example in which a display device is mounted in back and side mirrors, but this embodiment describes an example in which it is mounted in the interior of a vehicle body.

[0104]

Fig. 19 shows the interior of the vehicle and it shows the vicinity of the driver's seat and the fellow passenger's seat. A steering wheel 901, operating buttons 902, a display device 903, and a speaker 904 are illustrated in Fig. 19 as an example. A driver who drives the vehicle operates the steering wheel 901. A user uses the operating buttons 902 when operating a sensor or a camera. It can be provided for the display device 903 according to the present invention. The speaker 904 can be used as an audio device.

[0105]

The display device shown in this embodiment is placed in the vicinity of the driver's seat. However, the present invention is not limited to this. For example, it may be provided on the driver's seat or the fellow passenger's seat to be easily viewed

by a passenger sitting in a rear seat. The placement of the operating buttons 902 and that of the speaker 904 shown in this embodiment are only an example and may be mounted in any other places in the vehicle. The operating buttons 902 may be used in a remote controller.

[0106]

This embodiment can be freely combined with Embodiment mode of the Invention or Embodiments 1 to 4.

[0107]

[Embodiment 6]

The display device of the present invention is used for various purposes. Application examples of vehicles in which the display device of the present invention is incorporated will be described.

[0108]

Embodiment mode of the invention has been described a vehicle for transport of a small number of passengers as an example. However, vehicles to which the present invention can be applied include motor vehicles, such as sport cars, trucks, buses, station wagons, special-purpose vehicles (ambulance cars, etc.), special-type vehicles (tractors, etc.), specially-equipped vehicles (tank trucks, etc.), electric train, and motorcycles. Fig. 18 shows examples thereof.

[0109]

Fig. 18(A) illustrates a bus for transport of a large number of passengers. The bus has a side mirror 2001, a back mirror 2000, a camera 2002, a sensor 2003, and lights 2004. The bus also has wheels 2005 and travels on a road by the wheels 2005. The display device of the present invention can be mounted in the side mirror 2001 and the back mirror 2000.

[0110]

Fig. 18(B) illustrates a sport car for enjoying sport driving. The passenger capacity of the sport car is ordinary two or less and at most four. The sport car has a

back mirror 2010, a side mirror 2011, a camera 2012, a sensor 2013, and lights 2014. The sport car also has plural wheels 2015 and uses them when traveling on a road. The display device of the present invention can be mounted in the back mirror 2010 and the side mirror 2011.

[0111]

Fig. 18(C) illustrates an electric train car having a side mirror 2021, a camera 2022, a sensor 2023, and lights 2024. The car also has plural wheels 2025 and uses them when traveling on rails. The display device of the present invention can be mounted in the side mirror 2021.

[0112]

Fig. 18(D) illustrates a motorcycle having a side mirror 2031, a camera 2032, a sensor 2033, and a light 2034. The motorcycle also has plural wheels 2035 and uses them when traveling on a road. The display device of the present invention can be mounted in the side mirror 2031.

[0113]

As described above, the range of application of the present invention is markedly wide and the invention can be applied to all kinds of vehicles. Further, this embodiment can be freely combined with Embodiment Mode of the Invention or Embodiments 1 to 5.

[0114]

[Effect of the Invention]

According to the present invention, the display device is mounted in a side mirror (door mirror) and a back mirror (room mirror) provided on a vehicle, or in an interior portion of the vehicle. The display device displays an image of surrounding the vehicle, which is obtained by a camera provided on the vehicle. The field of view obtained through the side or back mirror can be increased thereby. Also, information obtained through the plural sensors mounted on the vehicle can be displayed arbitrarily by a user of the display device.

[0115]

The vehicle used in the present invention is provided with an alarm device which is constituted by an audio device and a display device. When an impact sensor detects a danger signal, an indication of a danger is provided on the display device and a warning of the danger is given through the audio device.

[0116]

As described above, the display device is provided in side and back mirrors or in an interior portion of a vehicle to enable a driver of the vehicle and a fellow passenger to obtain necessary information in an arbitrary case.

[0117]

[Brief Description of the Drawings]

[Fig. 1] A top view of a vehicle.

[Fig. 2] A front view of the vehicle.

[Fig. 3] A rear view of the vehicle.

[Fig. 4] A diagram showing an example of a back mirror used in the vehicle in the present invention.

[Fig. 5] A diagram showing an example of a side mirror used in the vehicle in the present invention.

[Fig. 6] A block diagram of the system of the vehicle.

[Fig. 7] A flowchart diagram of an impact sensor.

[Fig. 8] A flowchart diagram of a distance measuring sensor.

[Fig. 9] A diagram showing a display device used in the present invention.

[Fig. 10] A cross-sectional view of an active-matrix liquid crystal display device.

[Fig. 11] A top view of the active-matrix liquid crystal display device.

[Fig. 12] A block diagram of drive circuits of the active-matrix liquid crystal display devices.

[Fig. 13] A top view and a cross-sectional view of the active-matrix liquid crystal display device.

[Fig. 14] A cross-sectional view of an EL display device.

[Fig. 15] A top view and a cross-sectional view of the EL display device.

[Fig. 16] A diagram showing an example of the back mirror of the vehicle of the present invention.

[Fig. 17] A diagram showing an example of the back mirror of the vehicle of the present invention.

[Fig. 18] A diagram showing examples of vehicles to which the present invention can be applied.

[Fig. 19] A diagram showing a display device provided in an interior portion of the vehicle.

[Document Name] Abstract

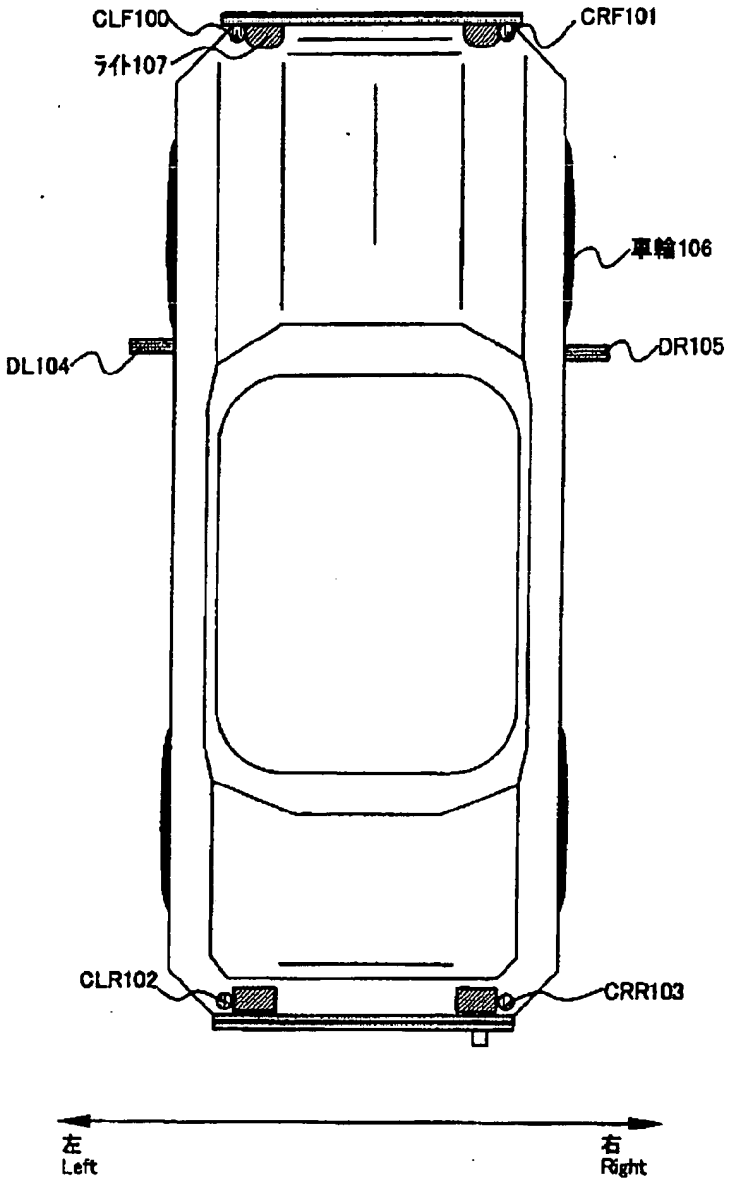
[Summary]

[Object] The field of view reflected by a side mirror or a back mirror mounted on the vehicle is widened.

[Solving Means] According to the present invention, to enable a driver driving the vehicle to confirm safety certainly even when it is difficult for the driver to visually recognize, a liquid crystal display device or an EL display device is provided in the side mirror (door mirror), the back mirror (room mirror) or in an interior portion of the vehicle. A camera is mounted on the vehicle and an image from the camera is displayed on the display device. Further, information read from a sensor (distance measuring sensor) having the function of measuring the distance between vehicles, and a sensor (impact sensor) having the function of sensing an externally applied impact force equal to or larger than a predetermined value is displayed on the display device.

【書類名】　図面

【図１】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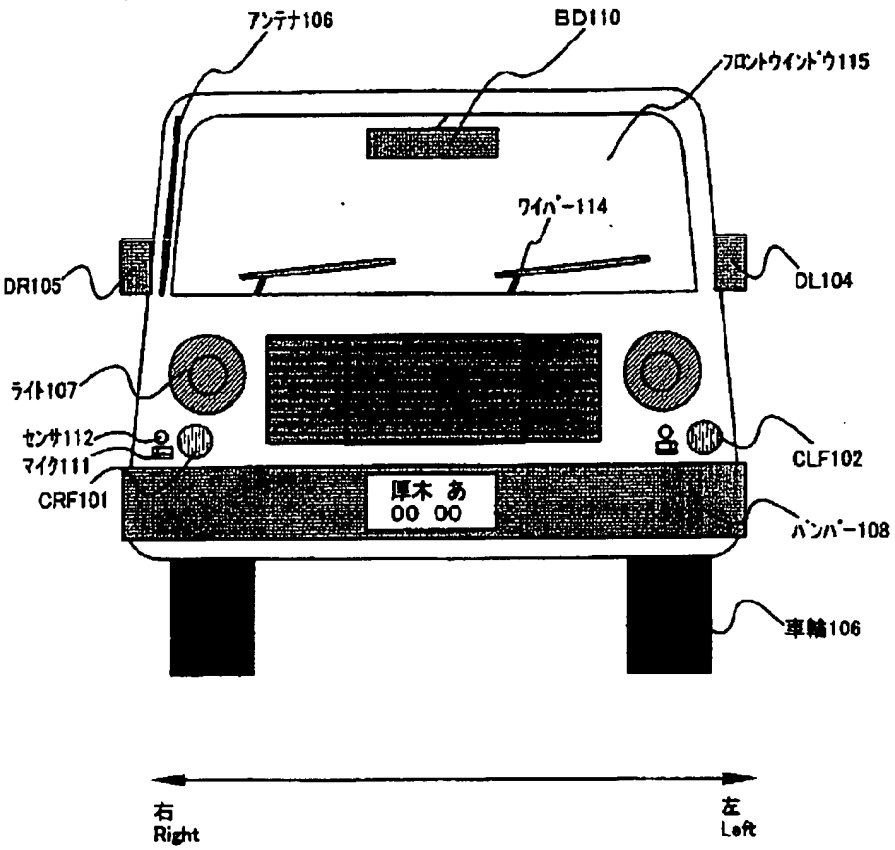
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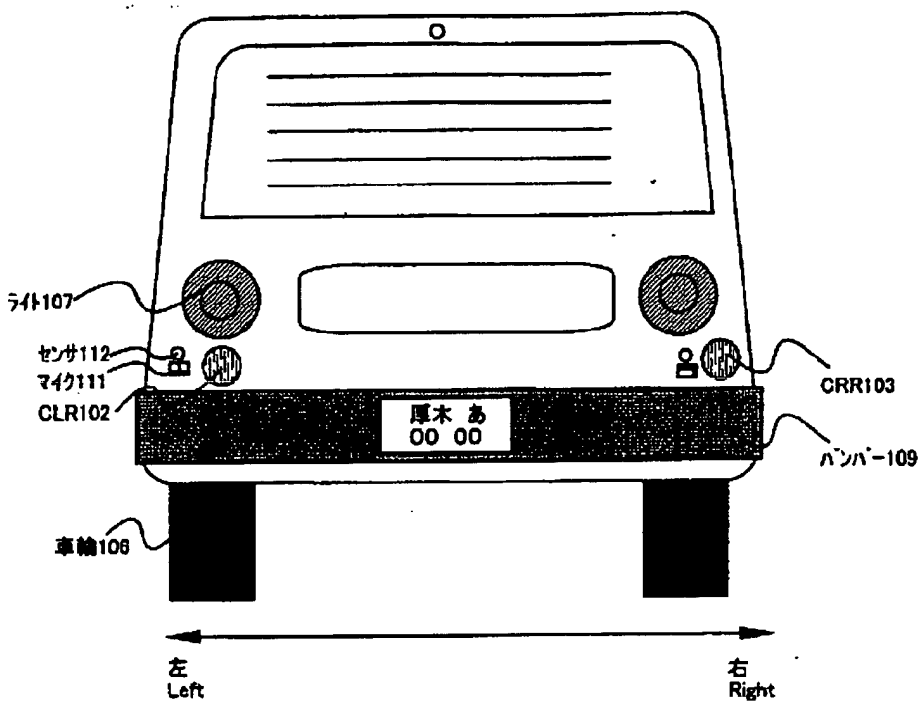
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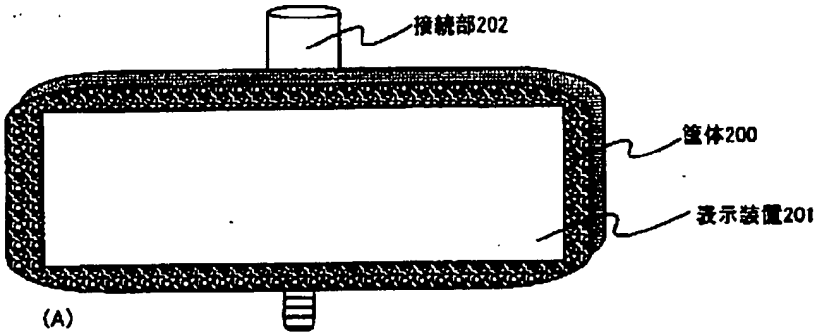
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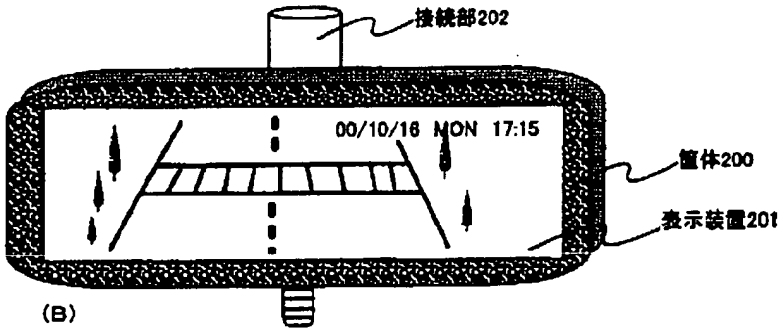
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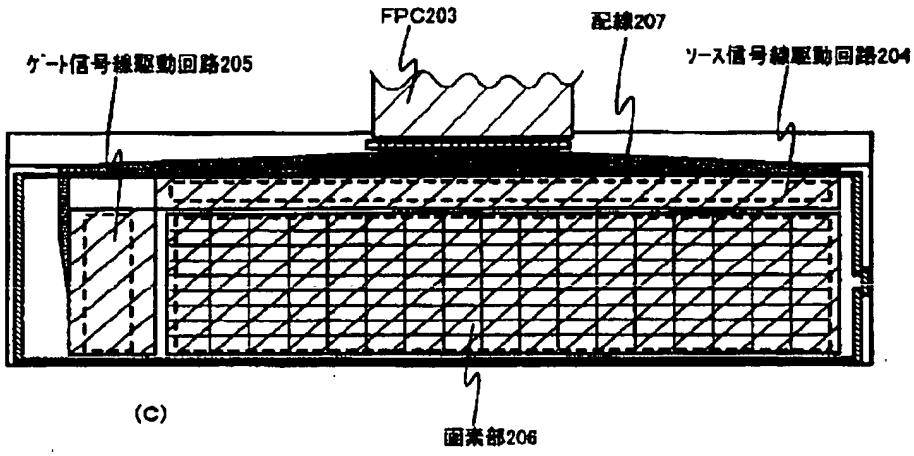
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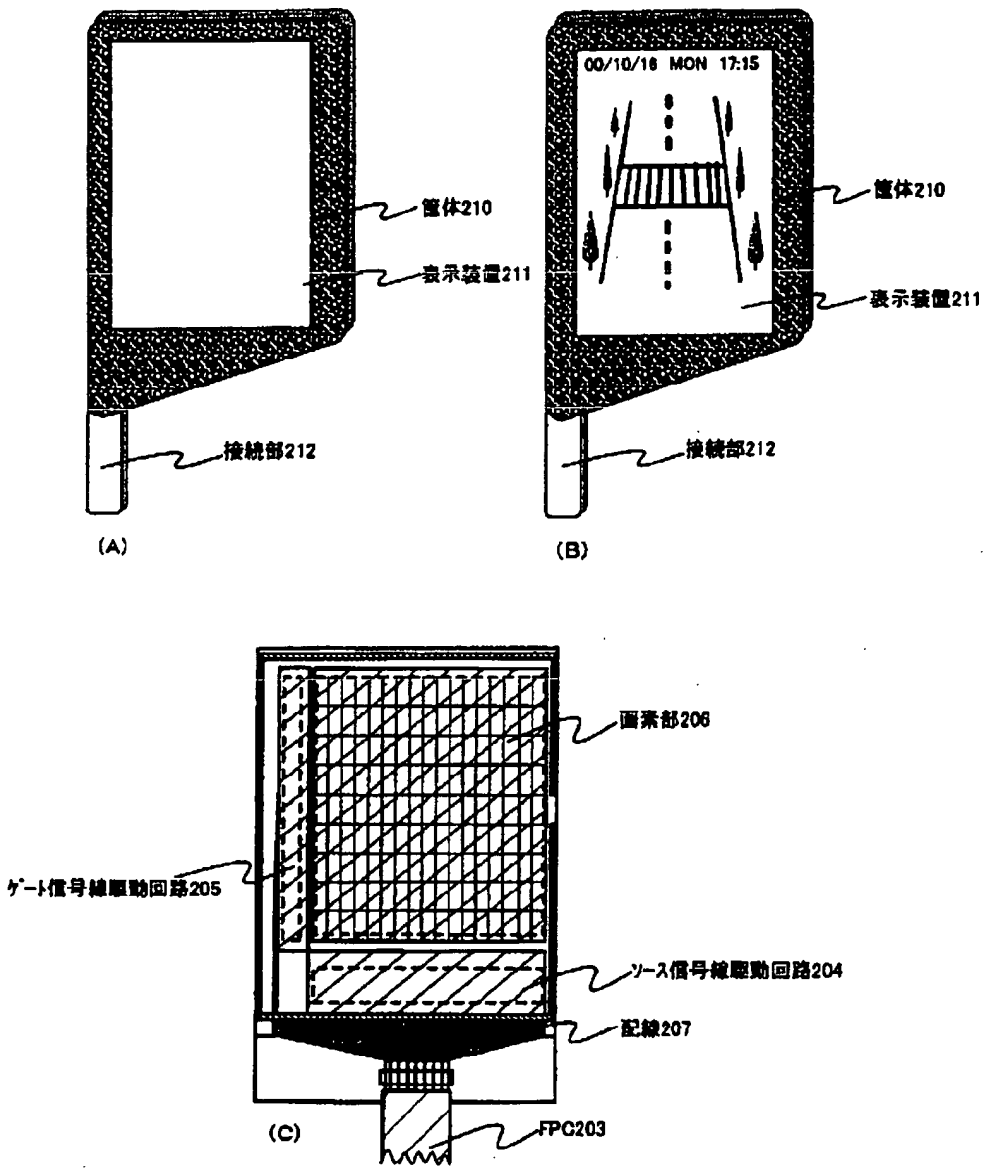
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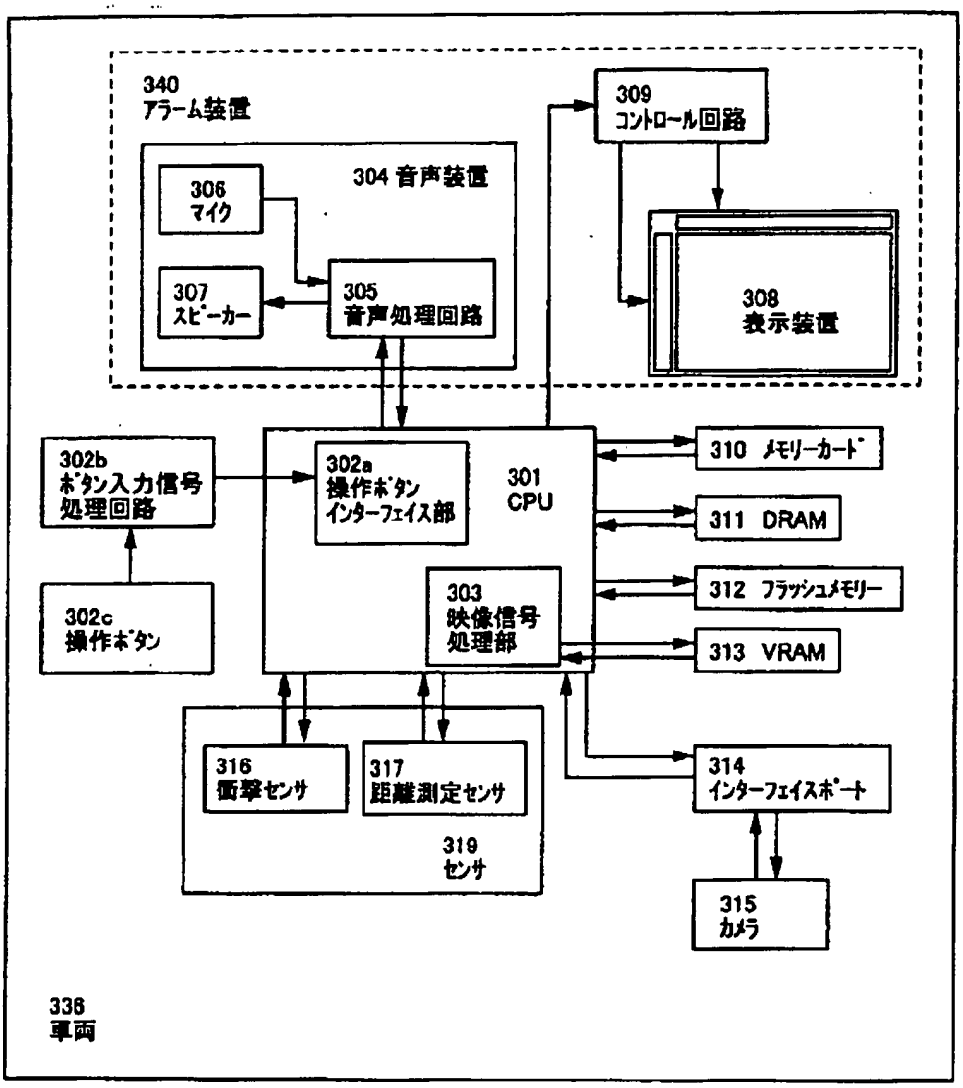
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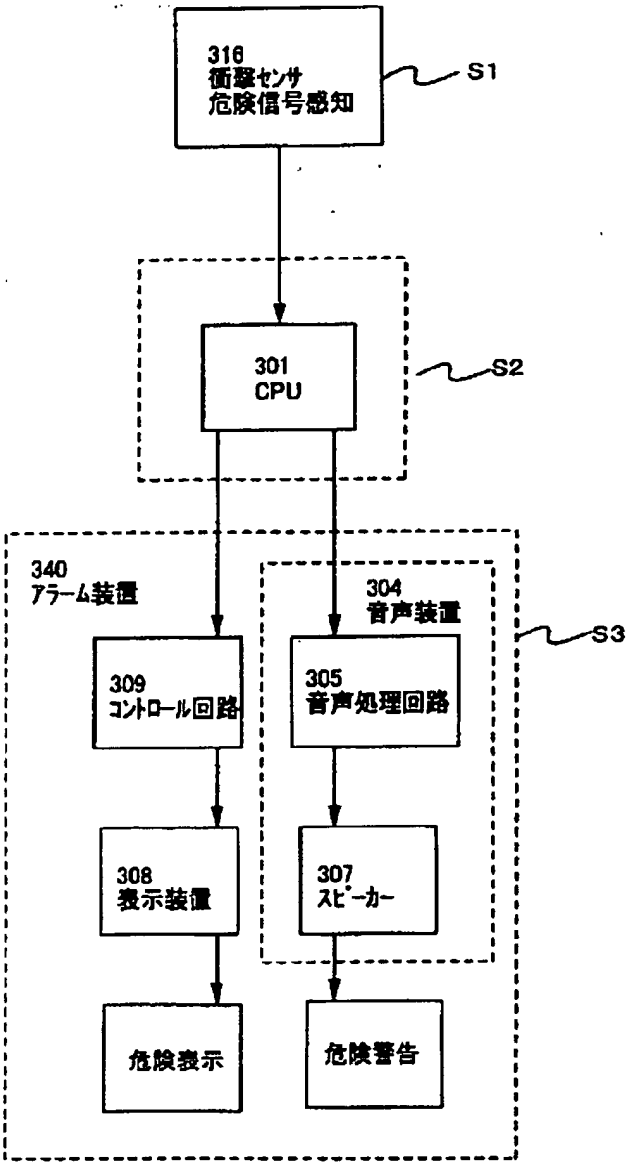
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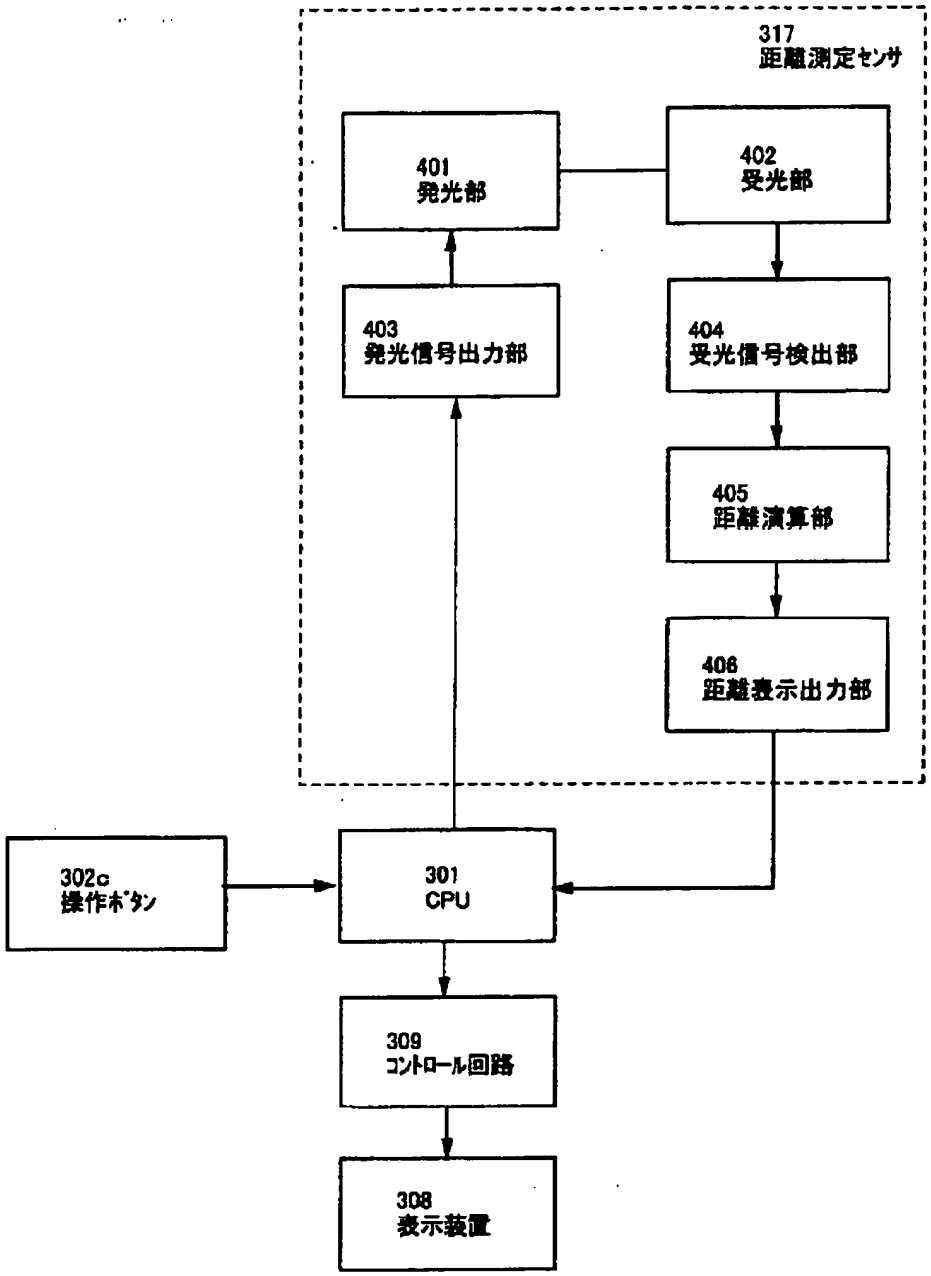
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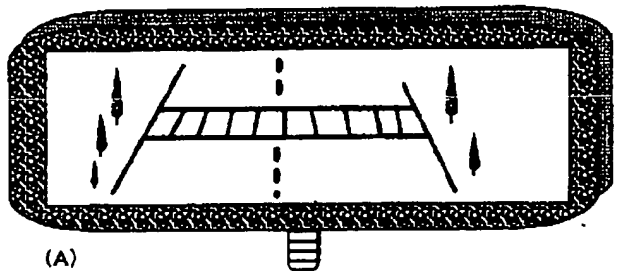
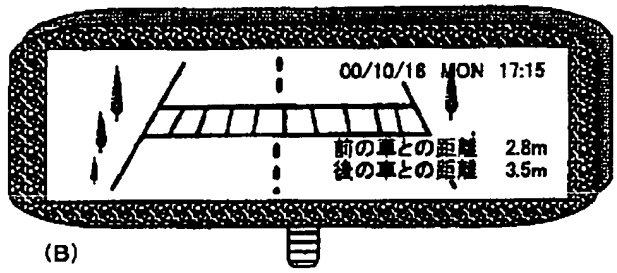
405
距離演算部
406
距離表示出力部
302c
操作ボタン
301
CPU
309
コントロール回路
308
表示装置

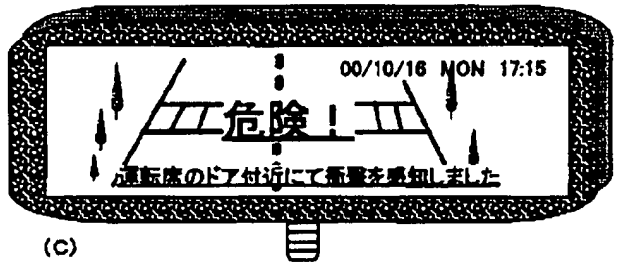
【図９】



(A)

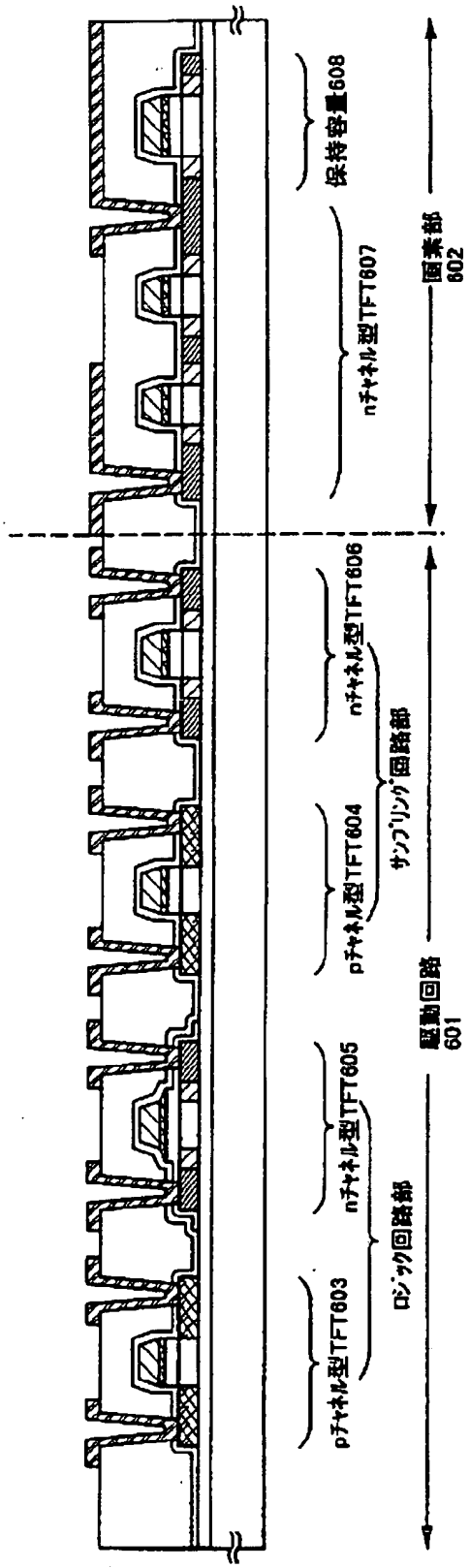

00/10/16 MON 17:15
前の車との距離 2.8m
後の車との距離 3.5m

(B)

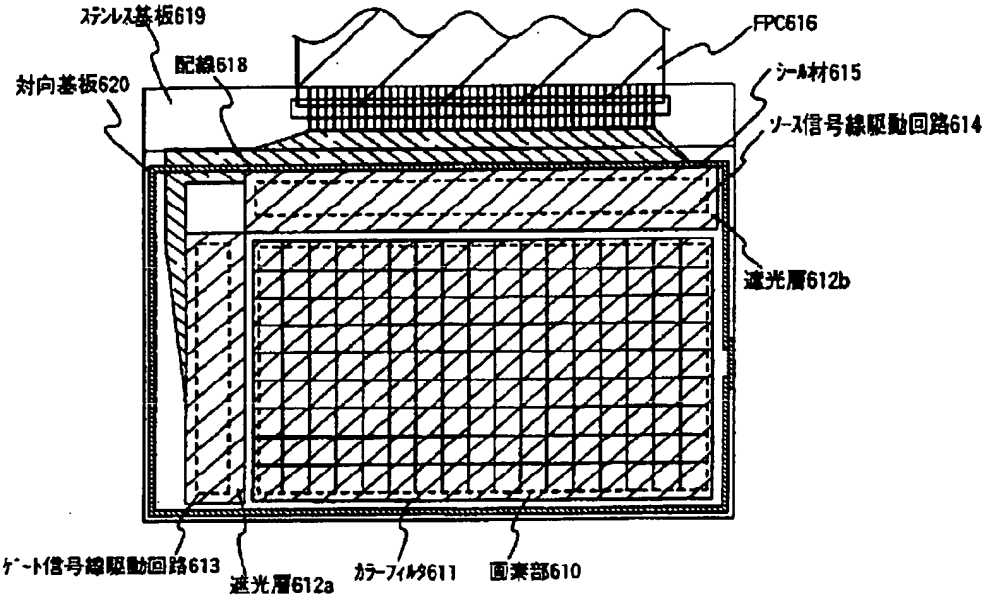

00/10/16 MON 17:15
危険！
運転席のドア付近にて振動を感知しました

(C)

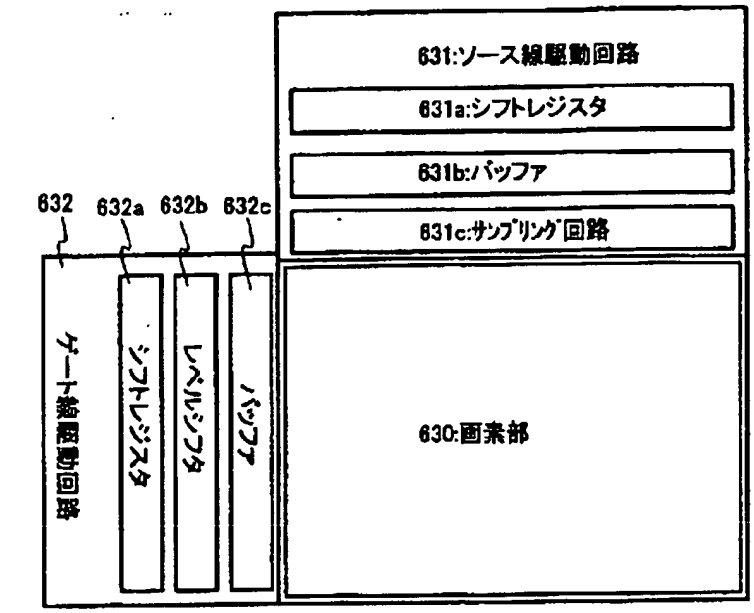
【図１０】


保持容量608
nチャネル型TFT607
画素部
602
nチャネル型TFT606
サンプリング回路部
pチャネル型TFT604
駆動回路
601
nチャネル型TFT605
ロジック回路部
pチャネル型TFT603

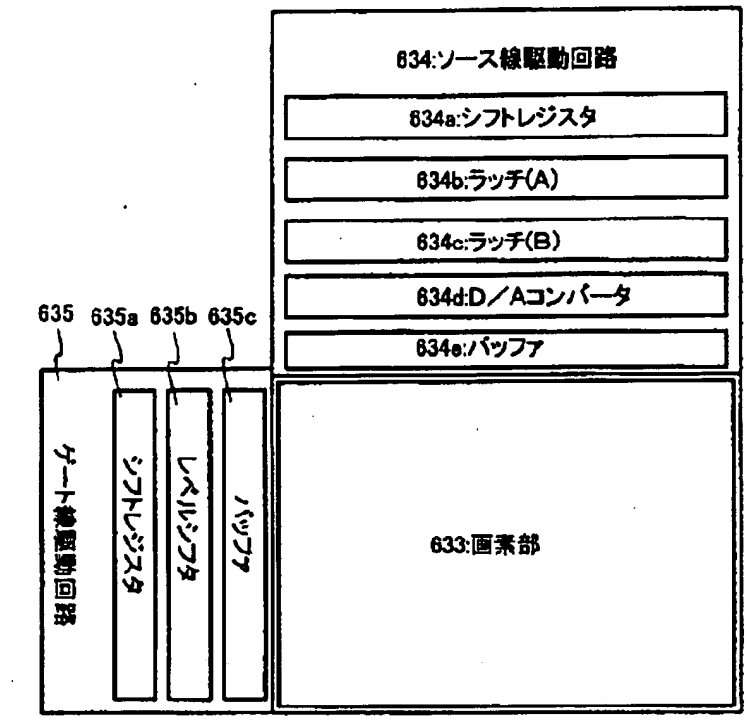
【図１１】


ｽﾃﾝﾚｽ基板619
配線618
対向基板620
FPC616
ｼｰﾙ材615
ｿｰｽ信号線駆動回路614
遮光層612b
ｹﾞｰﾄ信号線駆動回路613
遮光層612a
ｶﾗｰﾌｨﾙﾀ611
画素部610

【図１２】

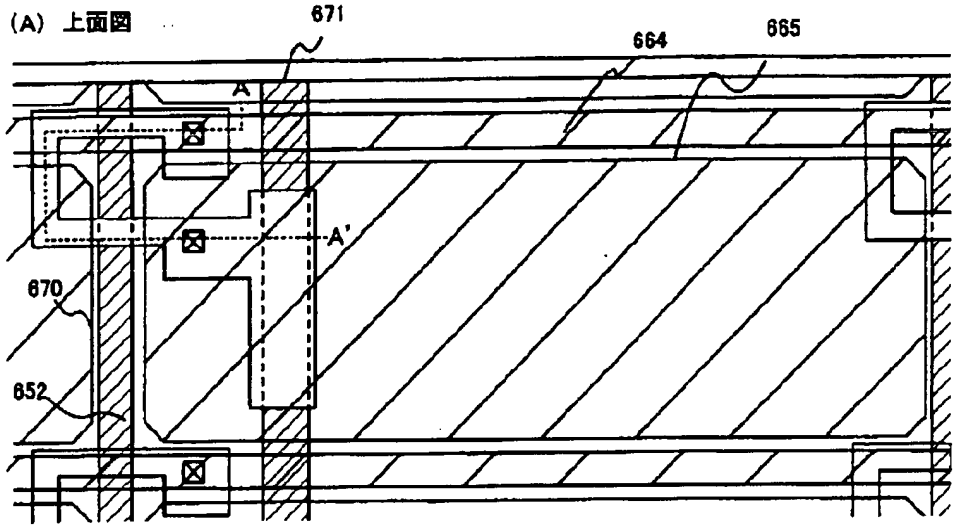

631:ソース線駆動回路
631a:シフトレジスタ
631b:バッファ
631c:サンプリング回路
632
632a
632b
632c
ゲート線駆動回路
シフトレジスタ
レベルシフタ
バッファ
630:画素部

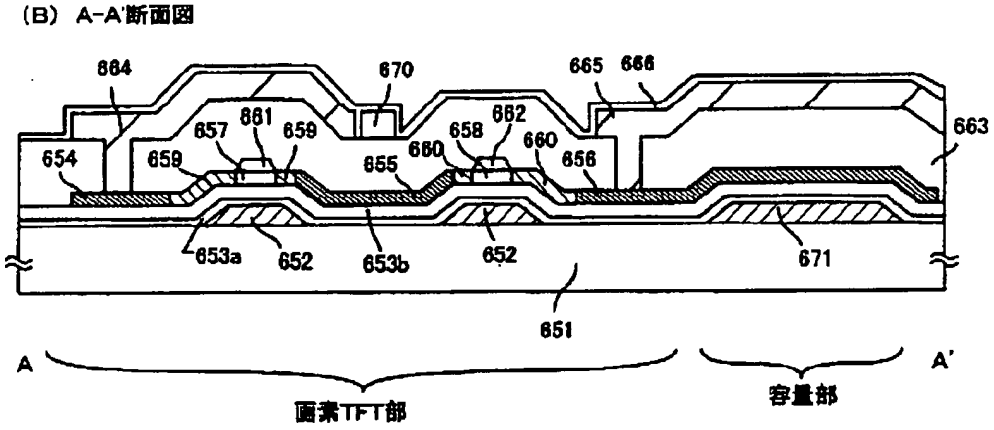
(A)


634:ソース線駆動回路
634a:シフトレジスタ
634b:ラッチ(A)
634c:ラッチ(B)
634d:D／Aコンバータ
634e:バッファ
635
635a
635b
635c
ゲート線駆動回路
シフトレジスタ
レベルシフタ
バッファ
633:画素部

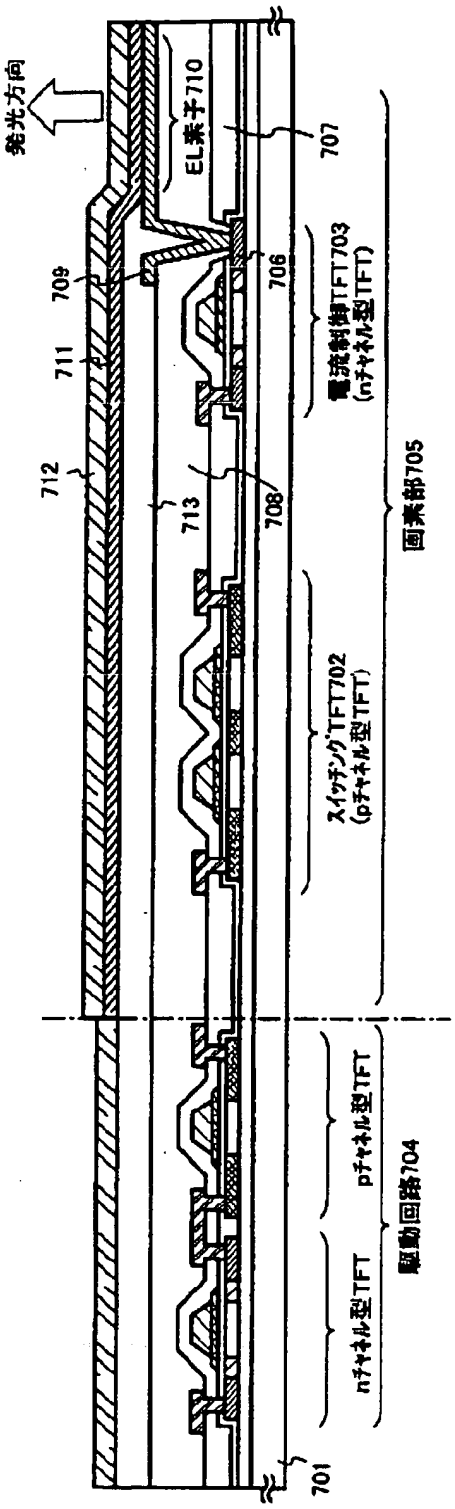
(B)

【図１３】

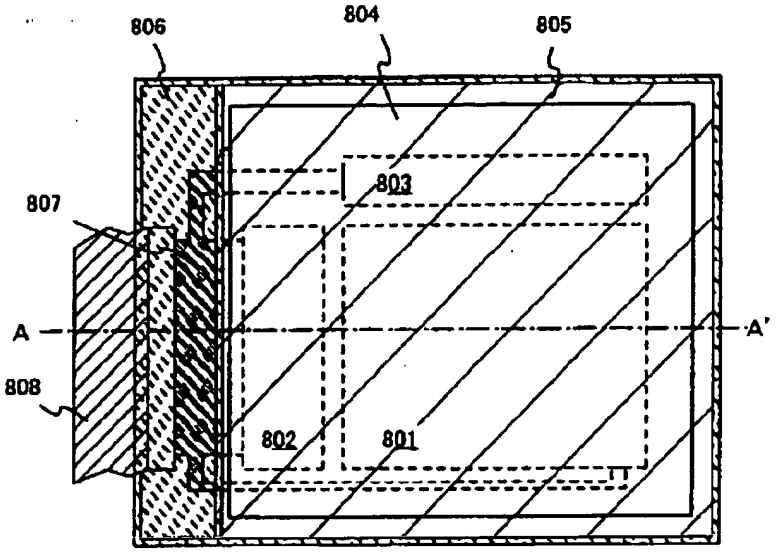

(A) 上面図
671
664
665
A
A'
670
652


(B) A-A'断面図
664
670
665
666
657
661
659
662
658
660
654
659
655
656
663
653a
652
653b
652
671
651
A
A'
画素TFT部
容量部

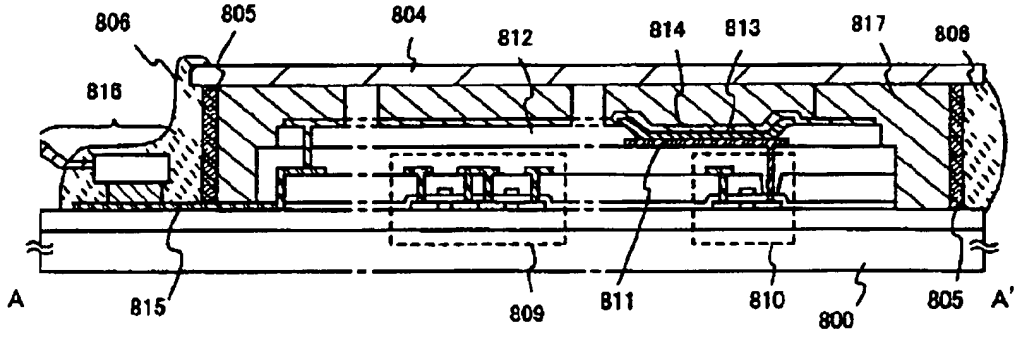
【図１４】


発光方向
EL素子710
707
709
706
711
電流制御TFT703
(nチャネル型TFT)
712
713
708
画素部705
スイッチングTFT702
(pチャネル型TFT)
nチャネル型TFT
pチャネル型TFT
駆動回路704
701

【図１５】

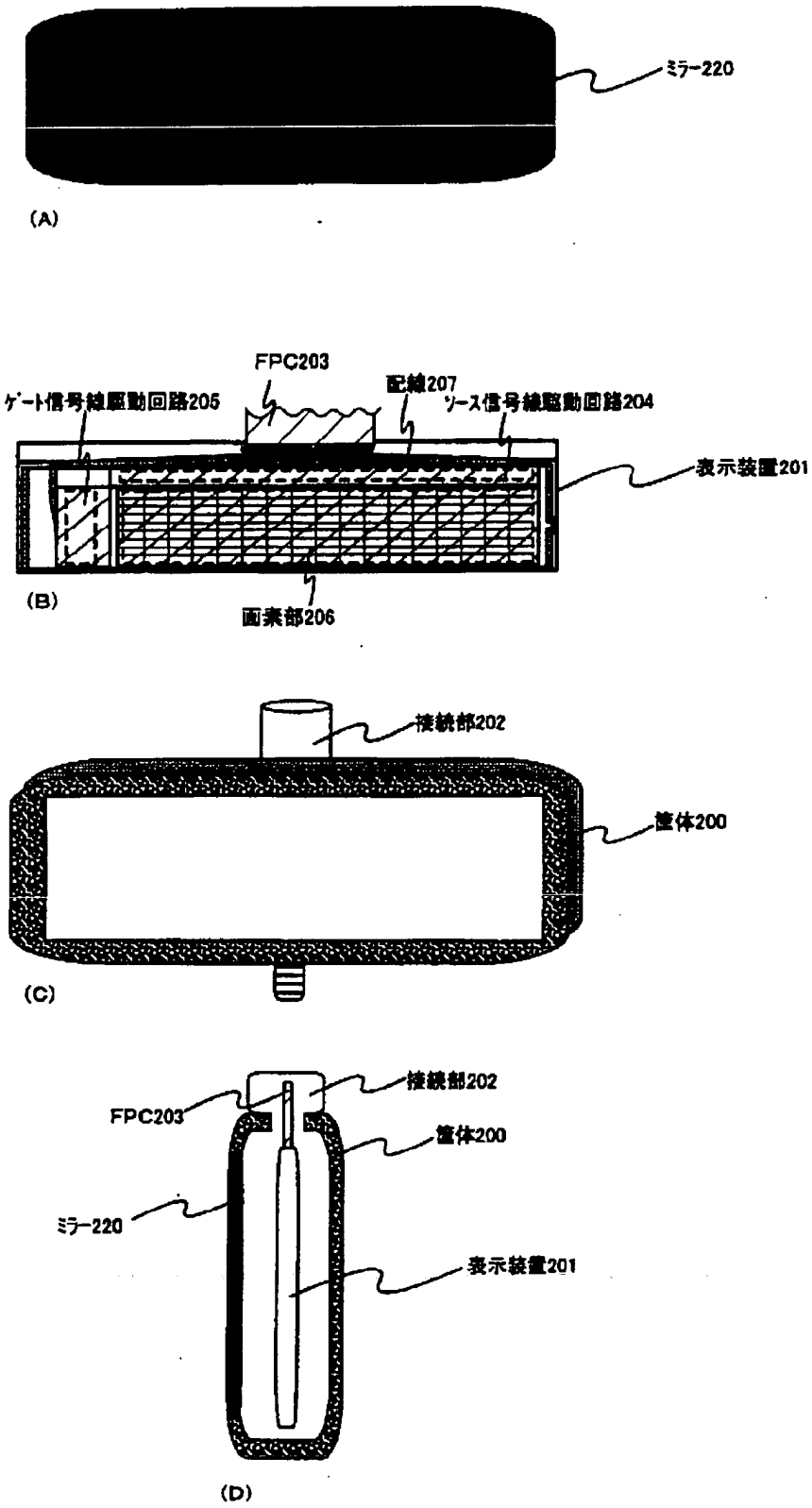

806
804
805
807
803
A
A'
808
802
801

(A)

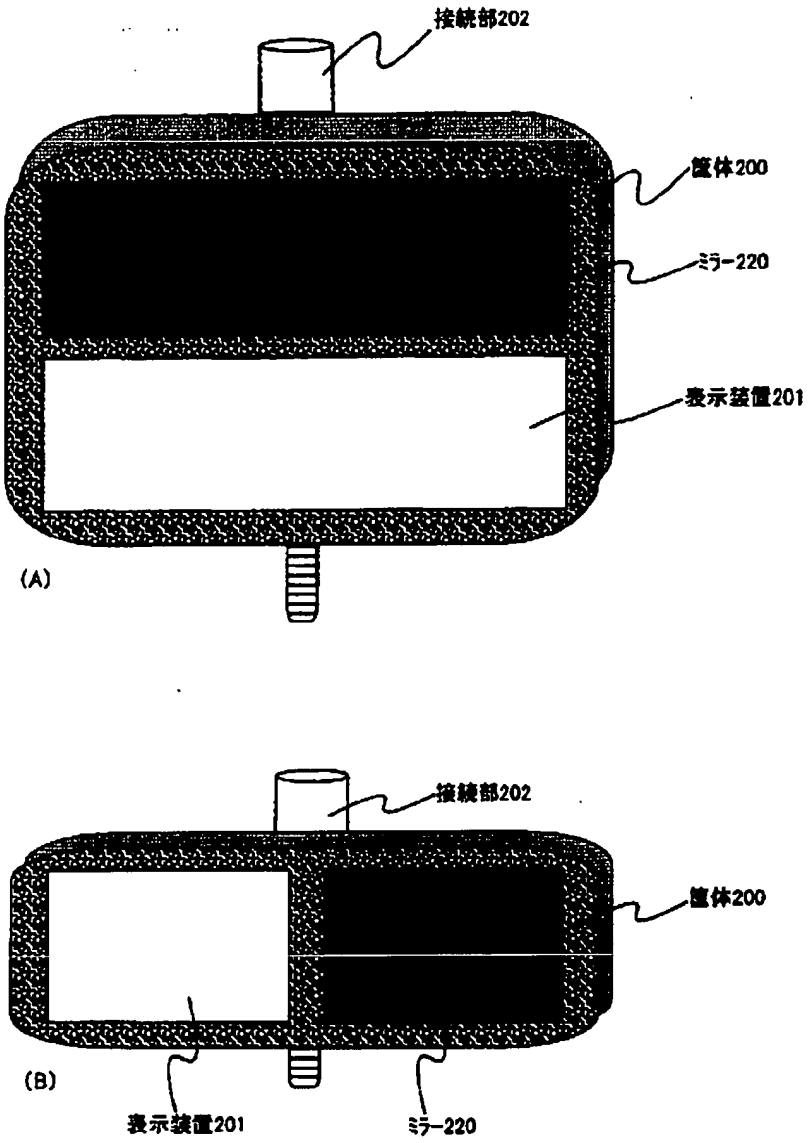

806
805
804
812
814
813
817
808
816
A
815
809
811
810
800
805
A'

(B)

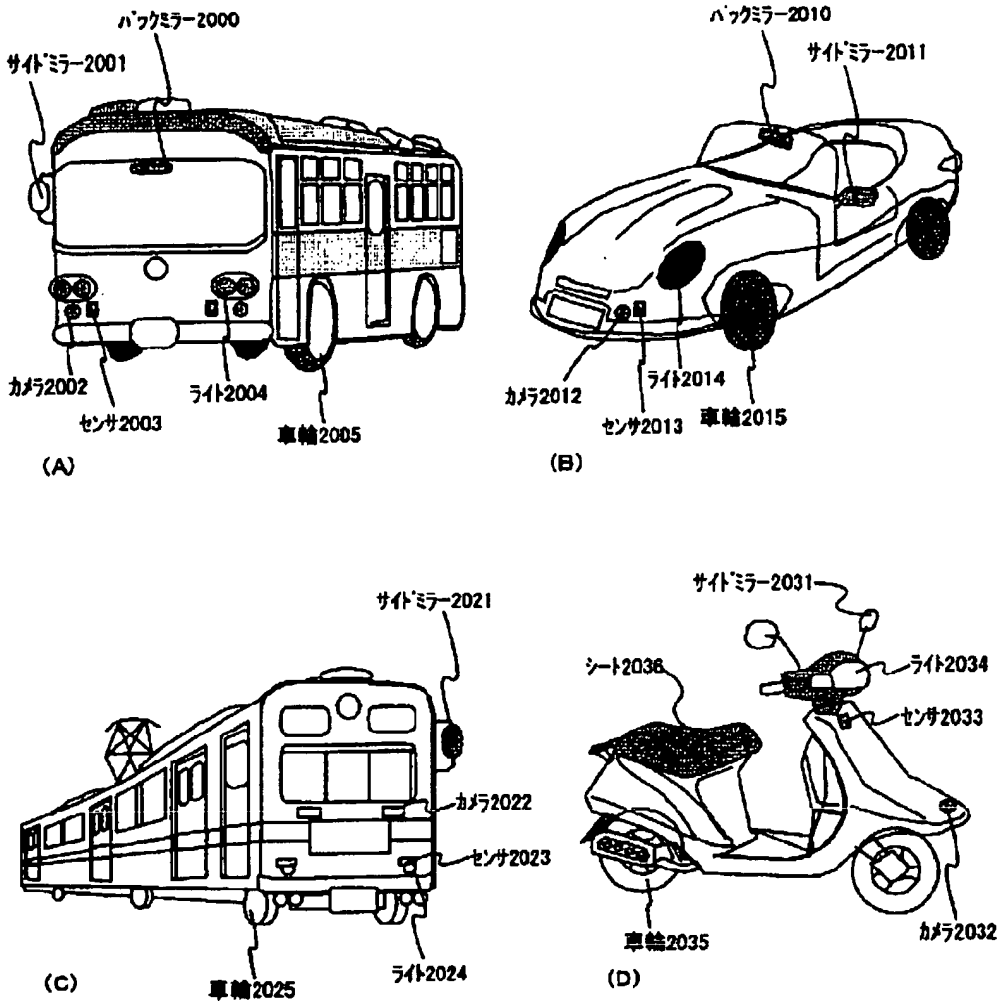
【図１６】


ミラー220
(A)
FPC203
配線207
ゲート信号線駆動回路205
ソース信号線駆動回路204
表示装置201
(B)
画素部206
接続部202
筐体200
(C)
接続部202
FPC203
筐体200
ミラー220
表示装置201
(D)

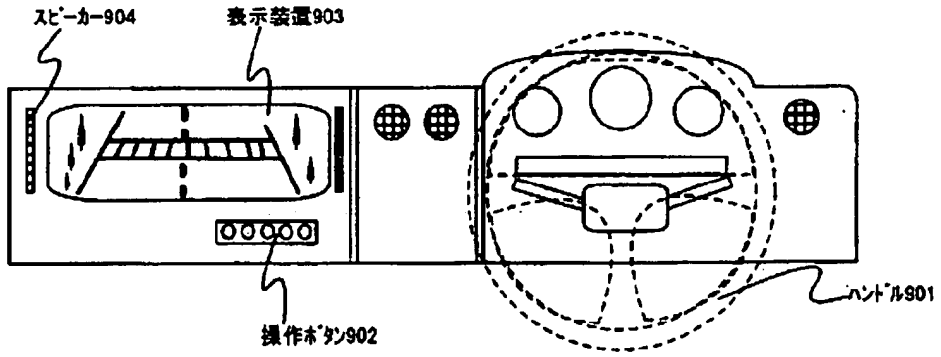
【図１７】


接続部202
筐体200
ミラー220
表示装置201
(A)
接続部202
筐体200
(B)
表示装置201
ミラー220

【図１８】


バックミラー2000
サイドミラー2001
カメラ2002
センサ2003
ライト2004
車輪2005
(A)
バックミラー2010
サイドミラー2011
カメラ2012
センサ2013
ライト2014
車輪2015
(B)
サイドミラー2021
カメラ2022
センサ2023
ライト2024
車輪2025
(C)
サイドミラー2031
シート2036
ライト2034
センサ2033
車輪2035
カメラ2032
(D)

【図１９】


スピーカー904
表示装置903
操作ボタン902
ハンドル901